



Newsletter

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At the Arboretum

The Institute of Ecosystem Studies is offering special workshops for winter and spring 1988. These workshops are designed for professionals and informed citizens actively involved in making the wisest use of the land.

IES sponsors free Sunday Ecology Programs on the first and third Sunday of each month. These public programs blend natural history with ecology to present a more complete picture of our environment.

For more information on Winter and Spring offerings at the Mary Flagler Cary Arboretum, see the Calendar on the back page of this Newsletter.

The IES Newsletter is published by the Institute of Ecosystem Studies at the Mary Flagler Cary Arboretum. Located in Millbrook, New York, the Institute is a division of The New York Botanical Garden. All newsletter correspondence should be addressed to the Editor.

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Dr. Likens Attends Vatican Meeting

During the fall of 1987, the Pontifical Academy of Sciences in the Vatican City State held three Study Weeks dealing with the impact of science and technology on the world's environment. The second in the series, "A Modern Approach to the Protection of the Environment", brought together twenty eminent environmental scientists from around the world. Among the invited participants was Dr. Gene E. Likens, Director the Institute of Ecosystem Studies, whose research at the Hubbard Brook Experimental Forest in New Hampshire discovered acid rain in North America.

Dr. Likens and his wife Phyllis Likens, executive secretary of the Hubbard Brook Ecosystem Study, spent November 2nd-7th at the Vatican City State, site of the Study Week. During the meetings, scientists from Europe, the Middle East, Africa, South America and the United States presented papers dealing with ethics for the use of natural resources, and new approaches and strategies for the protection of the environment. The subject of Dr. Likens' paper was environmental problems and protection strategies for temperate forests.

At the conclusion of the meetings, the group had an audience with Pope John Paul II. Prof. Carlos Chagas, president of the Pontifical Academy of Sciences, summarized the results of the Study Week. The Pope then spoke of the need for science and technology to work for humanity, and to be governed by ethical

and moral principles. He cited specific environmental problems, including acid rain, destruction of the forests in the wet tropics and the reduction of the ozone layer, and emphasized the need for education: "adverse effects on the environment can be corrected ... only by teaching people a new and respectful attitude towards the environment, an attitude that ensures the rational use of the natural resources which have to be preserved and passed on for the use of future generations."

After thanking the participants for contributing their scientific knowledge and enthusiasm to the Study Week, John Paul II met with each of them. Phyllis Likens, a member of the group, said upon her return to the Institute that the Pope was "gracious and soft-spoken. He seemed sincerely interested in learning a little about each of us, and spoke to me about my family and to Gene about his work ... a warm, likable man."

The first and third Study Weeks dealt with other modern challenges to science and society. "Aspects of the Use of Genetic Engineering" focused on the use of modern biotechnology to produce new vaccines and drugs for treatment of congenital diseases, while "Movement of Masses in the Universe" concerned questions of astrophysics, such as whether the universe will continue to expand.



Vatican photographers were on hand as Study Week participants met Pope John Paul II. Above: IES Director Dr. Gene E. Likens.

VATICAN PHOTO

Need: To know the exact position of research experiments being done in Mirror Lake, New Hampshire.

Problems: The inconvenience and cost of traditional surveying, and inaccessibility of Mirror Lake to conventional aircraft.

Challenge: To develop a means for low-cost aerial photography.

Solution: Balloon Photography

by Andrew Heafitz

[Editor's note: Andrew Heafitz is a freshman at the Massachusetts Institute of Technology. For the past few summers, while a high school student, he worked at the Hubbard Brook Ecosystem Study (HBES) in the White Mountains of New Hampshire. His interest in photography and rocketry led to some creative approaches to solving problems faced by ecologists with whom he worked. Following are excerpts from his summer 1987 report.]

In October 1985 I made my first successful test flight of a Motor-driven Aerial Photography System (MAPS). It consisted of a high-speed camera that I had invented, constructed almost totally out of balsa wood, that was launched 91 meters (300 feet) into the air using a model rocket. The camera could take 60 pictures in 6 seconds after it was turned on at parachute deployment. The rocket proved to be very fragile and unreliable (the payload section was made out of a cylindrical oatmeal box that would not stay shut during landing) leading to light leaks and ruined photographs).

I built a second rocket that was twice as big and much more reliable, and that could climb to 213 meters (700 feet) before deploying the parachute. The success rate for photographs increased, and while pictures tended to be slightly blurred some fine details were visible on close inspection. Photographs could be overlapped to form a mosaic covering a large area of ground.

Dr. Jonathan Cole, an aquatic ecologist at the Institute of Ecosystem Studies doing research at Hubbard Brook, asked if I could launch my rocket over Mirror Lake to photograph the locations of some equipment used in ecological studies of the lake. It was important to know the exact positions of certain experiments, but land-based surveying tended to be inaccurate due to shoreline irregularities, and was also time consuming and expensive. I said that I would work on the problem, to which Dr. Cole replied, "Don't work on it, think about it."

I had thought previously about a rocket that was capable of landing in water but was quite complex and therefore unreliable -- components light enough to fly in a rocket are often not very strong. Also, the balsa wood 35 mm camera did not take high quality pictures. The thought of sending up heavier, more expensive camera equipment in an unreliable rocket caused me to rethink the problem.

By the next weekend, I had bought two 1.2 meter (4 foot) diameter weather balloons and a radio control unit. These balloons, filled with helium and on a

tether line, would lift a Nikon camera with a 28 mm lens. By remote control I could turn on a motor that would trigger the camera. The balloon would then be hauled down, the motor reset, the film advanced, and the balloon sent back up again. Test photographs were clear and crisp: a piece of string could be seen from 55 meters (180 feet) in the air.



Jon Cole, left, and Andrew Heafitz with balloon photography apparatus.

A week later I had made some modifications and added a motor drive, and was ready to try out the contraption on Mirror Lake. This time I used one 1.8 meter (6 foot) weather balloon and one 1.2 meter balloon which could act as a parachute in case the larger balloon failed. The resulting photographs were too overexposed to be of any use, but it was apparent that the system had potential.

At the request of HBES scientist Dr. F. Herbert Bormann of Yale University, my next challenge was to take pictures of the Sand Box Experiment, a long-term study at Hubbard Brook that is examining processes of vegetation and soil development following the ice ages. On this flight, I used only one 1.8 meter balloon. The pictures came out very well, showing the sand boxes and the surrounding area.

The second trip to Mirror Lake was a big success. Pictures were taken from altitudes up to 365 meters (1200 feet), a height limited only by the length of the tether line. Results included several

excellent shots showing the entire lake and resolving the markers that were deployed on the lake beforehand. The photographs also showed shallow sandy areas in the lake, and possible sediment or vegetation plumes.



Balloon photo of Mirror Lake; tether line is at center right.

Balloon photography has a real advantage over traditional aerial photography in that it can get low altitude photos in hilly terrain where an aircraft cannot go. This, coupled with the fact that balloon-based aerial photos are considerably less expensive than those taken from aircraft, makes the technique especially well-suited to situations such as that at Hubbard Brook.

Mirror Lake, in the Hubbard Brook Experimental Forest, is the site of a number of long-term studies by IES and HBES scientists. Dr. Cole's interest in aerial photography arises from a project on which he works with IES colleagues Dr. Nina Caraco and Director Dr. Gene E. Likens: the phosphorus budget of the lake. Phosphorus is a nutrient that often limits the productivity of freshwater lakes, and at Mirror Lake it appears that major sources of this nutrient are particles falling from the atmosphere and the adjacent forest -- leaf fragments, insects, etc. To measure the amount of this input, the scientists moor "traps" -- floating pans filled with water to mimic the lake's surface -- around the lake. Correct evaluation of the data requires that the precise locations of these traps be recorded, and aerial photographs were the best way in which accurate maps could be made.

Library Improvement

Tools for today's scientists often boggle the mind with their capacity, complexity and circuitry. Perhaps the most important tool, however, has retained its status over the years, changing only in its capabilities and scope. This tool is the scientific library ... the "brain" of its host organization. Easy access to reference materials and to current scientific journals is critical to the staff of a modern research and education institute, and libraries need to be upgraded regularly to ensure that they continue to meet the needs of their users.

* * * * *

The scientific library of the Institute of Ecosystem Studies is located on the lower level of the Plant Science Building. On the shelves are more than 8,000 bound volumes, 250 journal subscriptions and numerous reference materials. The reading area looks out on a fern-covered stairway ... in spring, lady's slippers flower in the cool shadows. The atmosphere here is conducive to concentration and thought, and Institute scientists and other staff as well as members of the public search for scientific references, catch up on current publications or write papers of their own.

Thanks to a grant from the Mary Flagler

Cary Charitable Trust, the IES library will be upgraded to provide even better service to users. Recently IES Administrator Joseph Warner and Librarian Annette Frank announced this upgrade, and Ms. Frank reports that the new funds will extend library holdings, expand computer facilities and implement a state-of-the-art microfiche system.

To get a start on the improvement of the library collections, Ms. Frank interviewed each of the IES scientists to learn his or her reference needs. Special emphasis will be put on the acquisition of back issues of current scientific journal subscriptions, and subscriptions to additional journals will be entered. Back issues of periodicals will be bound, the best way to maintain these valuable materials for reference. New books will be ordered as well -- while the library already has a good collection of books dealing with specific topics in ecology and horticulture its peripheral holdings in other areas of science need to be expanded. The new funding will also provide for a temporary staff person who will assist with integrating the new journals and books into existing collections.

Easy accessibility to all IES library materials will be enhanced by the purchase of a more powerful computer.

I-Far Lin, assistant librarian, created a special data base to catalogue the recently-acquired limnology collection. The approximately 20,000 limnology entries have completely filled the memory of the existing computer, however, so a larger system is required before Mr. Lin's tailor-made data base can be applied to the cataloguing of other reprint collections, the IES map collection and additional library holdings.

Finally, since more and more scientific journals are now available on microfiche, a machine enabling scientists to read and print articles of interest will save space and time. Microfiche -- index card-sized photographic negatives showing miniaturized pages from journals past and present -- are made available to journal subscribers or may be requested through inter-library loan services. The microfiche reader/printer enlarges these images to standard sizes, and, if required, can provide a print-out for scientists' permanent files.

Ms. Frank is already starting to implement these goals. As they are met, the IES library will become an even better ecological reference facility, providing scientists, educators and others with fast and easy accessibility to the most complete collections possible.

Thanks for Your Help!

The September-October 1987 mailing of the IES Newsletter included something extra: a Newsletter Reader's Survey. What sorts of features do our readers like most in the Newsletter, and what other topics might be included? Which Arboretum activities and programs are of special interest? What are perceived as the major benefits of Arboretum membership?

Over 1,000 questionnaires were sent, and, as of December 31st, 196 had been returned -- close to 20%. This was an excellent response ... not only in the actual number of replies but also in the quality of the information received. Ideas were often new and interesting, and suggestions had been thoughtfully considered.

Newsletter articles on current research, education programs and local ecology and natural history seemed to be the most popular, and a majority of readers enjoyed learning about current Arboretum activities in the Calendar of Events. When asked about the technical level of the article, 85% of the readers felt they were "just right". Among the suggestions for additional topics to be covered, a listing of what is blooming in the Perennial Garden earned the most votes; information on

local air quality, from the IES Weather Station, was also requested. (These features will be included in subsequent issues of the Newsletter.)

The Perennial Garden topped the list of readers' interests at the Arboretum, closely followed by nature trails, adult education classes, the Greenhouse and the Gift Shop. The Arboretum is especially popular as a place to come for education and learning, as an attraction where members and friends bring out-of-the-area visitors, and as a site for nature study.

Arboretum members accounted for 70% of the responses. Reasons for membership were diverse, but personal interest in the environment was cited most often. Members appreciate receiving information on programs and activities, like to read the Newsletter, and take advantage of their membership discounts on classes and in the Gift Shop.

We thank all those who took the time to fill out and return the questionnaire, and invite our readers to offer comments and suggestions at any time. Write or call Jill Cadwallader, Program Specialist/Public Information at the Institute.



Each year The New York Botanical Garden honors staff members at an Award and Recognition Ceremony held at the Garden. At the December 17th, 1987 ceremony, two from the Institute of Ecosystem Studies received the Certificate of Achievement. Shown with Dr. James M. Hester (center), NYBG president, are: Jean G. Hubbell, research assistant working with Dr. Gary Lovett to learn more about the effects of air pollution on forests; and Stephen A. Bialousz, supervising mechanic in charge of the Institute's Automotive Shop.

In addition, the following IES employees received recognition for their years of service: 10-14 years: Stephen Bialousz, James Boice, David Bulkeley, Marvin Chadwell, Janice Claiborne, Marcia Davis, Bonnie Fiero, Phyllis Haight, Allan Kling, Jay McAninch, William Newkirk, Roger Powell, Owen Vose, Raymond Wincombe ... 15-19 years: Ralph Elliott, John Olson, Bradley Roeller ... 31-34 years: Richard Livellara.

Library Invites Public Use

The Institute of Ecosystem Studies has two library collections. Public use is welcome, as follows:

Resource Center (Gifford House)

This collection deals primarily with botany and horticulture. Books from the separate Circulating Collection may be borrowed by members of the Mary Flagler Cary Arboretum. The center is open to all for reference work.

Weekday Hours: 8:30 a.m. - 4:30 p.m.

Evening Hours -- by appointment
(call 914-677-5358)

Weekend Hours -- check in with the Gift Shop manager

Saturday: 9:00 a.m. - 4:00 p.m.

Sunday: 1:00 p.m. - 4:00 p.m.

Scientific Library (Plant Science Building)

This is a reference library featuring ecological journals and books. As materials are not available for loan, library users may use the Institute's photocopier for a nominal fee. The library is open while the librarian, Annette Frank, is on duty, and prospective users are asked to call ahead to make arrangements (914-677-5343, ext. 311).

Weekday Hours: 8:30 a.m. - 4:30 p.m., as above; closed weekends.

Visitor access permits are not required for the use of either library. Both the Resource Center and the Scientific Library are closed on public holidays.

Winter/Spring Calendar

ADULT EDUCATION PROGRAM

The Institute of Ecosystem Studies is pleased to announce its spring program in landscape design, gardening, botany and ecology:

Spring Semester Classes

Landscape Design Theory
Construction I. Grading and Drainage
Landscape Design II. Plan Development
Drawing for Plan Presentation
Insect Pests and Diseases of Plants
Plants for Landscaping: Woody Perennials
Spring Mushrooms
Frontiers in Ecology

Special Workshops

Mar. 5th: Plant Propagation and Management for Ecological Landscaping
May 7th: Ecological Design and Landscape Restoration
May 14th: Planting and Transplanting Trees and Shrubs
May 25th: Airphoto Interpretation and Land Use: An Introduction to Basic Techniques

For registration information, or to be put on the mailing list for the Adult Education Program catalogue, visit the Gifford House or call the Education Program Office at the number below.

ECOLOGICAL EXCURSIONS

Join us for one or more of the following trips:

Mar. 10th: The New York Flower Show
May 18th: Archaeology and Implements
May 20th: Spirit of Northern Waters
June 9th: Garden in the Woods
June 11th: The Ecology of Tivoli Bay: An Exploration by Canoe

Call the number below for information.

SUNDAY ECOLOGY PROGRAMS

Free public programs are offered on the first and third Sunday of each month. All programs are from one to two hours long, and begin at 2:00 pm at the Gifford House unless otherwise noted.

Tentative schedule (please call (914) 677-5358 to confirm the day's topic):

Mar. 6th: Ecosystem Recovery on Mount St. Helens (David Wood) - Talk
Mar. 20th: Visit to a Tropical Island (Mark Mattson) - Talk
Apr. 17th: (Title to be announced)

May 1st: The Fish of a Small Woodland Stream (David Strayer) - Walk
May 15th: How Plants Defend Themselves (Clive Jones) - Walk

For ecology walks, dress for the weather conditions; wear warm, waterproof boots. In case of inclement weather, call (914) 677-5358 after 1 pm to learn the status of the day's program.

Ecology talks are slide presentations or demonstrations held indoors at the Gifford House.

GREENHOUSE

The IES Greenhouse performs double-duty: it is a year-round tropical-plant paradise as well as a site for controlled environmental research. The public is invited to explore both aspects during Arboretum hours. There is no admission fee, but visitors should first stop at the Gifford House for a free permit.

SCIENTIFIC SEMINARS

The Institute's weekly program of scientific seminars features presentations by visiting scientists or Institute staff. All seminars take place in the Plant Science Building on Fridays at 3:30 p.m. Admission is free. For a schedule, contact Julie Morgan at (914) 677-5343.

ARBORETUM HOURS

Monday through Saturday, 9 a.m. to 4 p.m.; Sunday, 1 - 4 p.m. The Gift and Plant Shops are open Tuesday through Saturday 11 a.m. to 4 p.m.; Sunday 1 - 4 p.m. Closed on public holidays. (Also closed during the deer hunting season and when the internal roads are snow covered.) All visitors must obtain a free permit at the Gifford House for access to the Arboretum.

MEMBERSHIP

Take out a membership in the Mary Flagler Cary Arboretum. Benefits include a special member's rate for IES courses and excursions, a 10% discount on purchases from the Gift Shop, six issues of the IES Newsletter each year, free subscription to *Garden* (the beautifully illustrated magazine for the enterprising and inquisitive gardener), and parking privileges and free admission to the Enid A. Haupt Conservatory at The New York Botanical Garden in the Bronx. Individual membership is \$25; family membership is \$35. For information on memberships, contact Janice Claiborne at (914) 677-5343.

For more information, call (914) 677-5358 weekdays from 8:30-4:30.

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